

ABSTRACT

A rectangular wave or a waveform similar to the rectangular wave is output with a conductive angle no less than  $120^\circ$  but no more than  $150^\circ$  during low-speed operation, but output a rectangular wave, a sine wave or a waveform similar to them with a conductive angle no less than  $130^\circ$  but under  $180^\circ$  by changing the frequency only while maintaining the PWM duty constant at high-speed operation, making it possible to realize high-efficiency and low-noise operation at low-speed operation, secure stable high speed, and prevent peak current of effective current because the current waveform also comes closer to sine wave.